School of Economics and Management

NEKP32, Economics: Mathematical Methods - Dynamic Optimisation, 7.5 credits

Nationalekonomi: Matematiska metoder - dynamisk optimering, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus is an old version, approved by The Board of the Department of Economics on 2011-06-07 and was last revised on 2022-05-31. . The revised syllabus applied from 2022-05-31. , autumn semester 2022.

General Information

This is a single subject master course in economics. The course is either obligatory or optional within a number of master programmes at Lund University.

Language of instruction: English
Teaching may be in Swedish if all registered students have a good knowledge of Swedish.

Main field of studies	*Depth of study relative to the degree requirements*
Economics	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

Knowledge and understanding

Students shall understand and be able to solve:

- difference and differential equations,
- dynamic optimisation problems.

Competence and skills

Students shall have the ability to:

- analyse difference and differential equations using the methods treated in the

course,
- analyse dynamic optimisation problems using the theories and methods treated in the course,
- apply the mathematical methods on economic problems.

Judgement and approach
Students shall master the relevant mathematical theory in such a way that the student is able to independently gain insights into economic theory based on the mathematical methods and be able to gain insights in more advanced mathematical theory within the areas covered in the course.

Course content

The course deals with the mathematical methods used for analyzing dynamic problems in ordinary economic theory. The usage of the mathematical methods is exemplied by a selection of economic problems. It also contains the theory for linear dierential equations of the rst order, the theory for linear dierence and dierential equations of higher order with constant coecients and the solution of separable, Bernoulli and Euler dierential equations. The course also covers solving linear systems of dierence and dierential equations using the eigenvalue methods and Guassian elimination. Additionally, the course includes analysis of systems of linear and nonlinear dierence and dierential equations using phase diagrams and phase plane analysis. The course, moreover, defines and distinguishes between various concepts of stability for equilibria such as global, local and saddle point stability. The course deals with methods for solving dynamic optimization problems with and without stochasticity using open-loop and closed-loop solutions. The theories covered are calculus of variations, control theory and dynamic programming in both continuous and discrete time. These include the Euler equation, the fundamental equation of dynamic programming, the Bellman equation, the Hamilton-Jacobi-Bellman equation and Pontryagin's maximum principle.

Course design

1. Teaching: Teaching mainly consists of pre-recorded material. To a limited extent there is some teaching on campus.

Assessment

1. Examination: A written exam take place at the end of the course. There will be further opportunities for examination close to this date. The examination also consists of a number of home assignments that are performed during the course. The marks from the home assignments are carried forward to examinations taken the same term. Other forms of examination can be used to a limited extent.

2. Limitations on the number of examination opportunities: –

The University views plagiarism very seriously, and will take disciplinary action against students for any kind of attempted malpractice in connection with examinations and assessments. Plagiarism is considered to be a very serious academic offence. The penalty that may be imposed for this, and other unfair practices in examinations or assessments, includes suspension from the University for a specified period.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, E, D, C, B, A.
1. Grading: Grade (Definition), Points or percentage out of maximum points, Characteristic

A (Excellent), 85–100, A distinguished result that is excellent with regard to theoretical depth, practical relevance, analytical ability and independent thought.
B (Very good), 75–84, A very good result with regard to theoretical depth, practical relevance, analytical ability and independent thought.
C (Good), 65–74, The result is of a good standard with regard to theoretical depth, practical relevance, analytical ability and independent thought.
D (Satisfactory), 55–64, The result is of a satisfactory standard with regard to theoretical depth, practical relevance, analytical ability and independent thought.
E (Sufficient), 50–54, The result satisfies the minimum requirements with regard to theoretical depth, practical relevance, analytical ability and independent thought, but not more.
U (Fail), 0–49, The result does not meet the minimum requirements with regard to theoretical depth, practical relevance, analytical ability and independent thought.
Students have to receive a grade of E or higher in order to pass a course.

2. Weighting grades from different parts of the course: –

3. Grading scales for different parts of the course: –

Entry requirements

Students admitted to the Master Programme in Economics and have passed the course NEKN32 "Mathematical methods, advanced level" are qualified for this course. For other students, at least 90 ECTS-credits in economics are required. These must include the course NEKN32 "Mathematical methods, advanced level" or an equivalent course.

Further information

1. Transitional regulations: This course replaces NEKM47 "Mathematical Methods – Dynamic Optimisation ".

2. Limitations in the period of validity: –

3. Limitations: This course may not be included in the same degree as NEK717 "Mathematical Methods – Linear and Dynamic Optimisation" or NEKM47 "Mathematical Methods – Dynamic Optimisation".

4. Similar courses: –

5. Limitations in renewed examination: –

Subcourses in NEKP32, Economics: Mathematical Methods - Dynamic Optimisation

Applies from H11

1101 Mathematical Methods - Dynamic Optimisation, 7,5 hp
Grading scale: Fail, E, D, C, B, A